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U. S. DEPARTMENT OF AGRICULTURE

FARMERS' BULLETIN No. 1299

SHALL I BUY
A TRACTOR?



The following series of six bulletins has been prepared under the direction of the Committee on Farm Power appointed by the Secretary of Agriculture to represent the Bureau of Agricultural Economics, Bureau of Public Roads, and the Bureau of Animal Industry in a cooperative study of all phases of the farm-power problem:

Farmers' Bulletin 1295: What Tractors and Horses Do on Corn-Belt Farms.

Farmers' Bulletin 1296: Changes Effected by Tractors on Corn-Belt Farms.

Farmers' Bulletin 1297: Cost of Using Tractors on Corn-Belt Farms.

Farmers' Bulletin 1298: Cost of Using Horses on Corn-Belt Farms.

Farmers' Bulletin 1299: Shall I Buy a Tractor? (For a Corn-Belt Farm).

Farmers' Bulletin 1300: Choosing a Tractor. (For a Corn-Belt Farm).

This bulletin, which is No. 5 of the series, discusses the various points to be considered by the farmer who is trying to decide whether to buy a tractor or continue to farm with horses.

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SHALL I BUY A TRACTOR?

(FOR A CORN-BELT FARM)

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CONTENTS.

	Page.		Page.
Size of farm-----	1	Work which tractors will do-----	4
Topography-----	2	Drawbacks to ownership and use-----	6
Soil-----	3	Benefits from ownership and use-----	8
Size of fields-----	3		

THE TRACTOR QUESTION—whether to buy a tractor or to continue to farm entirely with horses—is one that has proved very puzzling to many farmers. Any Corn-Belt farmer, even though he has never used a tractor, knows in a general way at least what work these machines will do, or are supposed to do, under ordinary farm conditions. No doubt he has been approached by different tractor dealers regarding the purchase of a machine, and from them he has heard glowing accounts of the advantages to be derived from the ownership and use of a tractor, the effect it will have upon his farm, and what it will enable him to do in addition to what he accomplishes with horses. If the purchase of a machine is being considered he will be interested in all that is said, but the careful farmer will want verification of all that has been told him of the benefits that will accrue when a tractor is added to his farm equipment. He will also want to consider very carefully whether the necessary expenditure for a machine and equipment will be warranted by such benefits.

This bulletin discusses the points to be considered when deciding whether to buy a tractor or not. With the assistance of the information contained in this and the other bulletins of this series, and of that which can be obtained from neighboring tractor owners, it is hoped that any Corn-Belt farmer will be aided in making the proper decision.

SIZE OF FARM.

Much has been published in a speculative way regarding the smallest size of farm on which a tractor can be used profitably, but no definite acreage has ever been fixed upon as the minimum size, and there is no likelihood that the minimum ever will be fixed to a certainty. Each farm is a problem in itself, and the conditions and peculiarities of one are lacking or magnified on another. It seems certain under present conditions, however, that tractors capable of pulling 2 or 3 plows can not be used profitably on very many Corn-Belt farms with less than 80 acres in crops. There are some farms of even twice this size where the use of a tractor would not be justified.

In the minds of tractor owners themselves there is a wide variation as to the minimum size of farm upon which tractors can be used profitably. In 1918 the United States Department of Agriculture asked 600 Illinois tractor owners the question, "What in your opinion is the smallest farm on which a tractor the size of yours can be used profitably?" The answers received were as follows:

Of 124 men who owned 2-plow machines the answers varied from 70 acres or less to 330.

Of 435 men who owned 3-plow machines the answers varied from 70 acres or less to 330 and over.

Of 41 men who owned 4-plow machines the acreage ran from 71 to 330 and over.

The above figures show the wide difference in opinion regarding the size of tractor and size of farm which existed in the minds of these men, and while an advancement has been made in tractor construction since this investigation was made, there is still a divergence of opinion among tractor owners on these points.

A better guide than total size of farm in determining whether a tractor could be used profitably would be the crops raised and the acreage of each, as it will be these two factors rather than the total size of farm which will govern the amount of work to be done. For some farms that might seem to be large enough to warrant the ownership of a tractor it may be unwise to purchase a machine. The organization and cropping system of a farm may be such that in spite of the addition of a tractor the number of horses can not be reduced. Such a farm might be one where the cultivation of corn requires as great a number of horses as any other operation. It will be understood that the ordinary four-wheeled type of tractor is not suitable for cultivating intertilled crops. Again, on some farms where the acreage in fall-sown grain is considerably larger than that devoted to corn, the number of work stock required to cultivate the corn and do the other necessary horse operations at that time may be capable of preparing the land for the planting of all the crops. However, such farms are the exception rather than the rule in the Corn Belt.

However, the tractor may sometimes prove a profitable investment, even though it does not permit the owner to dispose of any work stock. The value of the work done with the tractor and the time saved may more than offset the cost of keeping the work stock which might ordinarily be displaced.

TOPOGRAPHY.

The general lay of the land in the Corn Belt is ideal for the use of tractors. (See Fig. 1.) In those sections of this region where the land is hilly, some difficulty may be experienced in operating a tractor successfully. On gently rolling land, however, the tractor will work as well as where the land is level.

Farmers' Bulletin 1295—What Tractors and Horses Do on Corn-Belt Farms—states that where the land is hilly it will often be impossible to use a tractor, as the tendency to slip and slide downhill can not be overcome, and that on some hills it will take most of the power to propel the tractor without a load. Such conditions are perhaps rare, but where they may occur the question as to whether to buy a tractor can be disposed of without further consideration.

SOIL.

With ordinary soil conditions, such as are found on most Corn-Belt farms, tractors will perform efficiently. Where the soil conditions are peculiar, difficulty may sometimes be experienced.

A tractor is a valuable help in plowing and preparing virgin fields for crops. While the ability of a tractor to plow a field hitherto uncultivated will not often in itself justify the purchase of a machine, this feature should be given proper credit with the other advantages which might accrue from ownership.

Men who have never owned or operated a tractor perhaps feel that the use of such a machine on freshly plowed land would be injurious to the soil. This opinion, however, is not shared by most tractor owners. Of the 286 men who were interviewed in 1920 in Ohio, Indiana, and Illinois 95 per cent used their machines for disking, 28 per cent used them for harrowing, either alone or in combi-

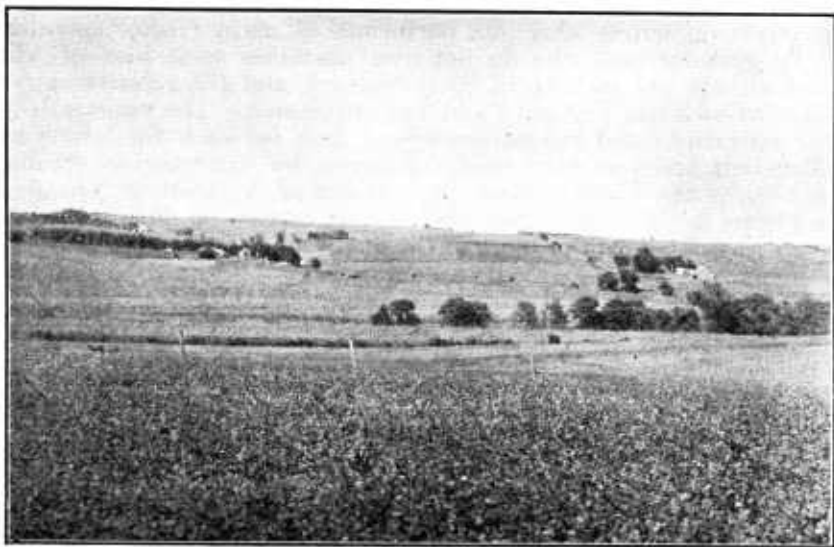


FIG. 1.—Typical Corn-Belt topography. Tractors work well here.

nation with some other implement, and 14 per cent used them for all of their plowing and fitting ground prior to planting, and for disking and harrowing after planting.

Farmers' Bulletin 1295—*What Tractors and Horses Do on Corn-Belt Farms*—discusses in more detail various soil conditions under which tractors perform with varying degrees of success.

SIZE OF FIELDS.

The first tractors were all large machines, built for use on the big western ranches. These machines would sometimes travel for miles before turning, and the operator was never cramped for room when turning at the ends of the field. However, they were unsuitable for field work on the smaller Corn-Belt farms, as a great deal of difficulty was experienced in turning and getting around at the ends of

fields, in getting close to fences, and in plowing irregular fields. However, no difficulty need be experienced now in using a tractor in the size of field ordinarily found in the Corn Belt, as the smaller tractors now available are capable of being handled very easily in fields of various sizes and shapes. No figures are available as to the smallest sized field in which a tractor can work successfully, but no farmer with a level or rolling farm need fear that his fields will be too small for the successful use of a tractor, provided his farm as a whole is large enough and his work of such nature as to warrant the investment in a tractor.

WORK WHICH TRACTORS WILL DO.

Every farmer in deciding whether to buy a tractor will be interested in determining beforehand what work a tractor will do on his farm. In a general way, every farmer knows the drawbar and belt operations for which tractors are most commonly used. However, there are numerous other jobs performed by many tractor operators.

To give farmers who do not own machines some idea of what uses owners are making of their tractors, and the relative importance of each use, Figures 2 and 3 are presented. The various drawbar operations and the percentage of uses for each for which 286 Corn-Belt tractors were used, as shown by information obtained in 1920 by the United States Department of Agriculture, are given in Figure 2. The operations shown were carried on during the year by at least 5 per cent or more of the men.

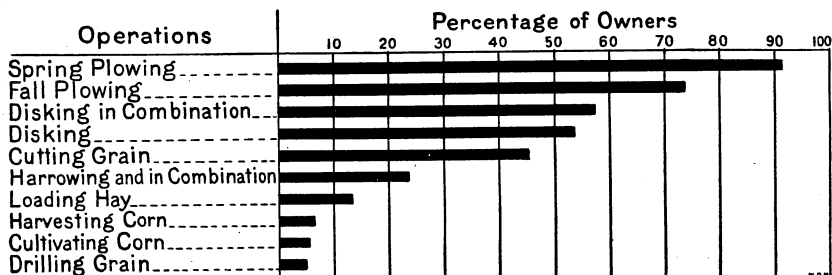


FIG. 2.—Drawbar operations for which 286 tractors were used, and the percentage of users for each. No operation carried on by less than 5 per cent of men is listed.

Figure 2 shows the drawbar operations for which Corn-Belt tractors are most commonly used. However, there are numerous other operations performed, but not in sufficient number to compare with those given. The following list of operations shows the different drawbar uses made of tractors, other than those given in Figure 2, exclusive of custom work on 191 Corn-Belt farms in 1918 (see Farmers' Bulletin 1093, Influence of the Tractor on Use of Horses, pp. 10 and 12):

Listing.
Rolling.
Packing.
Planking.
Pulling manure spreader.

Mowing hay.
Pulling hay fork.
Dragging roads.
Grading roads.

Moving buildings.
Stretching fence.
Pulling out hedge.
Clearing land.

The different belt operations for which the 286 tractors were used by 5 per cent or more of the men are shown in Figure 3.

As with the drawbar operations, there are many scattering operations performed on the belt. The following list of operations, other than those given in Figure 3, shows the different uses made of tractors on the belt for the 191 Corn-Belt farms in 1918:

Running saw mill.	Baling hay and straw.	Pumping water.
Mixing concrete.	Elevating grain.	Running cider mill.

To the farmer who is trying to decide whether to purchase a tractor, it may be said that ingenious tractor owners use their machines for many other miscellaneous jobs.

It may be possible to perform custom work for the neighbors, the amount done depending upon the number of machines already in the community which are doing such work. It must be understood, however, that if custom work is done it should always be done at a profit. Some operators who do work for their neighbors, more

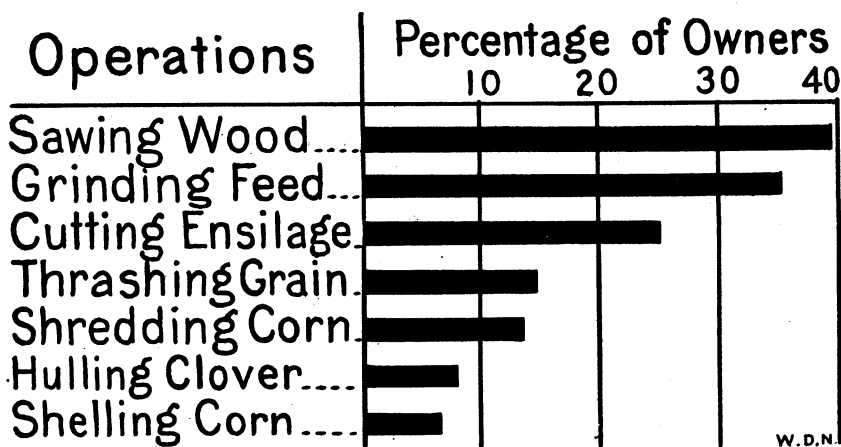


FIG. 3.—Belt operations for which 286 tractors were used, and the percentage of users for each. No operation carried on by less than 5 per cent of the men is listed.

for accommodation than anything else, frequently find that it has been done at a loss. If the number of tractors in the neighborhood is small, there will perhaps be all the work one wants to handle, while if there are a considerable number of machines the work to be done may be negligible. However, the possibility of custom work may always be considered when a tractor is purchased. If the time permits, work can often be found, and a fair profit may be made for the time and labor expended if the operator is careful to consider all of the expenses connected with the use of the machine. (See Farmers' Bulletin 1297, Cost of Using Tractors on Corn-Belt Farms.)

Not every farmer who buys a tractor, however, uses it for custom work. Of the 286 farmers interviewed, as previously mentioned, 183 did some custom work with their tractors. This work amounted to an average of seven days per year for each tractor. It is perhaps the general impression that most custom work is belt work. As a matter of fact, 116 of these men did drawbar work and but 113

did belt work. Over half of the drawbar custom work done by these men was plowing, which will be true in most localities in the Corn Belt. The work done on the belt will consist first of thrashing (see Fig. 4), with shredding and silo filling following. Naturally the man who is considering buying a tractor will be interested in the adaptability of the machine, not only for the ordinary jobs, but for emergency work or work of an unusual nature. Farmers' Bulletin 1295, *What Tractors and Horses Do on Corn-Belt Farms*, discusses the adaptability of the tractor, in detail, for different operations.

DRAWBACKS TO OWNERSHIP AND USE.

With a tractor, as with many other items of equipment a farmer may own, there are certain drawbacks. Before finally deciding

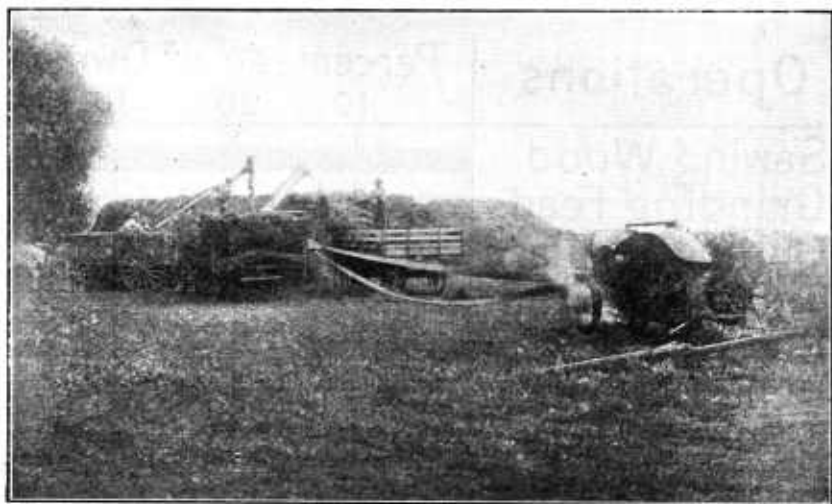


FIG. 4.—Many tractor owners increase their income by furnishing power for thrashing on neighboring farms.

whether or not to purchase a tractor the advantages and disadvantages should be carefully weighed and considered as applied to the home farm.

First cost.—The first cost of a tractor may be excessive for the amount of work there is to be done. On a farm where a tractor would do only a small amount of plowing and seed-bed preparation and where there is little or no belt work for which a tractor would be suitable, the investment in even the lowest-priced tractor might not be warranted.

Depreciation.—The depreciation on a tractor is one of the largest items of cost, yet one seldom considered. Depreciation is dependent upon the number of years that a tractor can be used and the number of days' work it will perform in that time.

Interest.—Interest is a fixed charge in tractor operation, the amount of which is governed by the first cost of the machine and the years

of service it will give. The amount of work to do should always be large enough and of enough importance to considerably more than offset both interest and depreciation.

Repairs.—Repairs are sometimes a large item of expense the amount of which is often dependent upon the individual operator and the care and attention he gives his machine.

Fuel and oil.—When fuel and oil are high in price as compared with horse feeds, the tractor is at a disadvantage. For example, in 1919 the price of all feeds was high, as was the price of fuel and oil. At that time tractors were used more by many farmers who owned them than in 1920 and 1921, when horse feeds had declined a considerably greater per cent than had fuel and oil. Figures from 286 farms on which tractors were owned show that, on the average, horses were a cheaper source of power than tractors for all drawbar operations on these farms in 1921. This refers to cost per acre and power only, and not to the total cost of performing the different operations or to the total annual cost of power for operating the farm. Farmers' Bulletin 1297, *Cost of Using Tractors on Corn-Belt Farms*, discusses the above items in detail.

Ability to operate.—The operator's lack of mechanical skill is sometimes such that he can not operate a tractor successfully. Two men under similar conditions as to size of farm, crops, and make of tractor sometimes will obtain different results, simply because of the greater ability of one to handle and use a machine than the other. Often it is found that this ability or lack thereof determines the success of a tractor.

Hired help.—Dependence on hired help to operate the machine is unsatisfactory in many instances. Reports received in 1920 from 1,219 tractor owners in the Corn-Belt and Northern Great Plains States who purchased tractors in 1917 or earlier indicate that the tractor operator has evidently been partly responsible for the success or failure of these early tractors. Only 11 per cent of the 534 early tractors which were still in use for field work in 1920 had been operated by hired help, and only 12 per cent of the 446 men who had replaced their first tractors with others depended on hired help, while 25 per cent of the 239 men who had discontinued the use of tractors for field work had allowed the machines to be operated by hired help.

Breakage.—Breakages and resultant loss of time at a busy season should seldom prove serious, provided ordinary service can be obtained on the machine from the local dealer. Breakage can not be forecasted, but the careful operator will usually recognize a warning in time to prevent a serious breakdown.

Quality of work.—With the introduction of the tractor there may be a falling off in the quality of the work done, owing to soil conditions, which may reduce the crop yield. This only occurs, however, when the soil has a tendency to pack easily.

Cost of equipment.—The cost of the implements for use with the tractor is greater than that of horse-drawn equipment of the same nature, owing to their larger size and heavier construction.

In the main, these will be the most important disadvantages to consider. There may be others, however, peculiar to the particular locality or farm, which should be given due consideration along with those mentioned.

BENEFITS FROM OWNERSHIP AND USE.

After considering the drawbacks incidental to the ownership and use of a tractor and giving each its proper place, the benefits should be studied as carefully and balanced against the drawbacks and it should then be fairly well established whether to purchase a tractor or not.

Displacement of work stock.—With the addition of a tractor on any farm there may be a certain number of horses which can be disposed of, the number depending on the size of the farm and the crops raised. On 172 of 286 farms in Ohio, Indiana, and Illinois, the sizes of which were not changed after the purchase of tractors, there was an average reduction of 2.2 head of work stock. After a tractor has been owned and the operator has become thoroughly familiar with it additional work stock sometimes can be disposed of. The amount received from the horses sold can be credited to the first cost of the tractor.

Saving in feed.—The remaining work stock on the farm may require less feed than formerly and a saving effected in this item, as many farmers who own tractors state that their work stock require considerably less feed per head than they formerly did. The tractor, in doing the heavy work formerly done by the horses, makes it possible to put them on a lighter ration than when they were doing all the work.

Saving in man labor.—A saving in man labor will be effected on most farms, the amount depending on the size of the farm. Some farmers report a saving of one or more hired men in the busy seasons.

Increase in size of farms.—Often it is found desirable to increase the size of the farm, owing to the ability of the tractor to do more work in a given time than was formerly done with horses. This is only true, however, where it is possible to rent or buy more land adjoining or in the near vicinity of the farm.

Increase in yield.—The yield per acre of corn, for example, may be increased by better and more thorough preparation of the seed bed with the tractor. With oats, however, a more thorough preparation than is usually given would perhaps not be warranted. By getting a crop in in better season owing to the greater rapidity with which the work is done, the tractor may tend to increase the yield.

Change in cropping system.—A desirable change in the cropping and rotation system may be effected through the use of the tractor and the elimination of a number of head of work stock.

Sale of horse-drawn implements.—The horse-drawn implements formerly used may be disposed of in part, provided they are salable and are not necessary for use with the remaining horses. Such machinery usually consists of plows and disks. The value of such sales may offset to some extent the cost of the new tractor equipment. (See *Farmers' Bulletin 1296, Changes Effected by Tractors on Corn-Belt Farms.*)

Belt work.—As the tractor is satisfactory for a large amount of belt work, it may be possible to save the hire of an engine for belt work, such as for running a small separator, silage cutter, shredder, or small corn sheller.

Elimination of stationary engine.—Where a tractor is owned it may not be necessary to have a stationary engine. The tractor will be available for the necessary heavy belt work which requires such power as the machine is capable of delivering. The tractor, however, will not be satisfactory for use where an engine of only 1 or 2 horsepower would be required for the work.

Custom work.—Often farmers in a neighborhood buy belt machines in cooperation. The owner of the tractor furnishes the power, and in this way thrashing and other work can be done at the most opportune time and the disadvantages of waiting for one's turn in a large thrashing ring eliminated. Where time permits, the value of custom work for neighbors may amount to a considerable item each year. Many farmers are doing such work at a profit to themselves.

Miscellaneous work.—There may be a certain amount of miscellaneous work which can be done more satisfactorily with the tractor than with the power formerly used. The value of such miscellaneous work can not be measured accurately in dollars, but it will have its weight along with the other advantages to be derived from ownership and use of a tractor.

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10

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